Disclaimer

Data obtained through Sentinel are intended to complement other types of evidence such as preclinical studies, clinical trials, postmarket studies, and adverse event reports, all of which are used by FDA to inform regulatory decisions regarding medical product safety. The information contained in this report is provided as part of FDA's commitment to place knowledge acquired from Sentinel in the public domain as soon as possible. Any public health actions taken by FDA regarding products involved in Sentinel queries will continue to be communicated through existing channels.

FDA wants to emphasize that the fact that FDA has initiated a query involving a medical product and is reporting findings related to that query does not mean that FDA is suggesting health care practitioners should change their prescribing practices for the medical product or that patients taking the medical product should stop using it. Patients who have questions about the use of an identified medical product should contact their health care practitioners.

The following report contains a description of the request, request specifications, and results from the modular program run(s).

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Overview for Request cder_mpl1r_wp031_nsdp_v01

Request ID: cder_mpl1r_wp031_nsdp_v01

Query Description: This report contains estimates of drug initiation following genetic testing among patients with relevant cancers.

Sentinel Modular Program Tool Used: Cohort Identification and Descriptive Analysis (CIDA) tool, version 2.2.1

Data Source: The query was run against the Sentinel Distributed Database (SDD) for the time period of January 1, 2013 to December 31, 2015. The request was distributed to 14 Data Partners on June 17, 2016. See Appendix A for a list of the latest dates of available data for each Data Partner.

Study Design: This request was designed to calculate exposures and outcomes. The number of qualifying patients with the exposure, event, number of eligible members, and member days were calculated overall and stratified by age group, sex, and year.

Exposures of Interest: The exposures of interest were genetic tests V-Ki-ras2 Kirsten rat sarcoma viral oncogene (KRAS), v-raf murine sarcoma viral oncogene homolog B1 (BRAF), epidermal growth factor receptor (EGFR), breakpoint cluster region-abelson (BCR-ABL), and breast cancer susceptibility gene (BRCA). These were defined using Healthcare Common Procedure Coding System (HCPCS) and Current Procedural Terminology (CPT-4) procedure codes. Please refer to Appendix B for specific codes.

Cohort Eligibility Criteria: Patients were required to be continuously enrolled in plans with both medical and drug coverage for either at least 183 days, 365 days, or 720 days before their testing date, during which gaps in coverage of up to 45 days were allowed. Half of the scenarios restricted inclusion to patients who also had the relevant cancer indication. Cancer indications were defined using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes. Please refer to Appendix C for specific codes. Members were excluded if they had the exposure of interest in 6 months (183 days) prior to the testing date. The following age groups were included in the cohort: 0-21, 22-44, 45-64, and 65+ years.

Follow-Up Time: Follow-up began on the day on which the first exposure of interest and continued until the first occurrence of any of the following: 1) disenrollment; 2) the study end date (December 31, 2015); 3) the end date of the data provided by each Data Partner (see Appendix A); 4) the end of follow-up (183 or 365 days); or 5) initiation of cancer treatment. Duration of follow-up was examined for 183 and 365 days for each genetic test. For the BRCA tests, patients were also followed for 720 days. Only the first valid incident genetic test that occurred during the study period was included per patient.

Event of Interest: The event of interest was cancer treatment (Cetuximab, Panitumumab, Trametinib, Dabrafenib, Vemurafenib, Cobimetinib, Afatinib, Erlotinib, Tagrisso, Gefitinib, Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib) which was defined using National Drug Codes (NDCs) and HCPCS. Please see Appendix D and E generic and brand names, and HCPCS procedure codes used to define events in this request..

Limitations: Algorithms to define exposures and events are imperfect and, therefore, may be misclassified.

Please see the *Appendix F* for the specifications of parameters used in the analyses for this request.

Notes: Please contact the Sentinel Operations Center Query Fulfillment Team (production@mini-sentinel.org) for questions and to provide comments/suggestions for future enhancements to this document.

Sentinel

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Glossary of Terms for Analyses Using Cohort Identification and Descriptive Analysis (CIDA) Tool*

Amount Supplied - number of units (pills, tablets, vials) dispensed. Net amount per NDC per dispensing. This is equivalent to the "RxAmt" value in the MSCDM.

Blackout Period - number of days at the beginning of a treatment episode that events are to be ignored. If an event occurs during the blackout period, the episode is excluded.

Care Setting - type of medical encounter or facility where the exposure, event, or condition code was recorded. Possible care settings include: Inpatient Hospital Stay (IP), Non-Acute Institutional Stay (IS), Emergency Department (ED), Ambulatory Visit (AV), and Other Ambulatory Visit (OA). For laboratory results, possible care settings include: Emergency department (E), Home (H), Inpatient (I), Outpatient (O), or Unknown or Missing (U). Along with the Principal Diagnosis Indicator, forms the Care Setting/PDX parameter.

Cohort Definition (drug/exposure) - indicates how the cohort will be defined: 1: Cohort includes only the first valid incident treatment episode during the query period; 2: Cohort includes all valid incident treatment episodes during the query period; 3: Cohort includes all valid incident treatment episodes during the query period until an event occurs.

Days Supplied - number of days supplied for all dispensings in qualifying treatment episodes.

Episodes - treatment episodes; length of episode is determined by days supplied in one dispensing or consecutive dispensings bridged by

Eligible Members - number of members eligible for an incident treatment episode (defined by the drug/exposure and event washout periods) with drug and medical coverage during the query period.

Years at Risk - number of days supplied plus any episode gaps and exposure extension periods all divided by 365.25.

Enrollment Gap - number of days allowed between two consecutive enrollment periods without breaking a “continuously enrolled”

Episode Gap - number of days allowed between two (or more) consecutive exposures (dispensings/procedures) to be considered the same treatment episode.

Event Deduplication - specifies how events are counted by the MP algorithm: 0: Counts all occurrences of an HOI during an exposure episode; 1: de-duplicates occurrences of the same HOI code and code type on the same day; 2: de-duplicates occurrences of the same HOI group on the same day (e.g., de-duplicates at the group level).

Exposure Extension Period - number of days post treatment period in which the outcomes/events are counted for a treatment episode.

Exposure Episode Length - number of days after exposure initiation that is considered "exposed time."

Lookback Period (pre-existing condition) - number of days wherein a member is required to have evidence of pre-existing condition (diagnosis/procedure/drug dispensing).

Member-Years - sum of all days of enrollment with medical and drug coverage** in the query period preceded by an exposure washout

Minimum Days Supplied - specifies a minimum number of days in length of the days supplied for the episode to be considered.

Minimum Episode Duration - specifies a minimum number of days in length of the episode for it to be considered.

Principal Diagnosis (PDX) - diagnosis or condition established to be chiefly responsible for admission of the patient to the hospital. 'P' = principal diagnosis, 'S' = secondary diagnosis, 'X' = unspecified diagnosis, '.' = blank. Along with the Care Setting values, forms the

Treatment Episode Truncation Indicator - indicates whether observation of the incident query code during follow-up requires truncation of valid treatment episodes. A value of Y indicates that the treatment episodes should be truncated at the first occurrence of an incident query code. A value of N indicates that the treatment episodes should not be truncated at the occurrence of the incident query code.

Users - number of members with exposure during the query period. Member must have no evidence of exposure(s) of interest (defined by incidence criteria) in the prior washout period. A user may only be counted once in a query period.

Washout Period (drug/exposure) -** number of days a user is required to have no evidence of prior exposure (drug dispensing/procedure) and continuous drug and medical coverage prior to an incident treatment episode.

Washout Period (event/outcome) -** number of days a user is required to have no evidence of a prior event (procedure/diagnosis) and continuous drug and medical coverage prior to an incident treatment episode.

*all terms may not be used in this report

**incident treatment episodes must be incident to both the exposure and the event

Table 1: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria

	Patients Receiving Test	Percentage of Patients Tested with Colorectal / All Patients Tested	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
KRAS									
183-day follow-up									
All Patients Tested	15,082	38%	5,716.4	655	4.34%	63,191,881	94,419,105.2	0.24	1145.83
Patients Tested with Colorectal Cancer	5,786		2,172.6	576	9.96%	175,507	139,629.2	32.96	2651.23
365-day follow-up									
All Patients Tested	13,145	39%	7,621.0	716	5.45%	50,653,633	81,067,435.9	0.26	939.51
Patients Tested with Colorectal Cancer	5,111		2,998.6	645	12.62%	166,904	169,191.6	30.62	2151.02
BRAF									
183-day follow-up									
All Patients Tested	14,276	15%	5,421.4	315	2.21%	63,192,570	94,422,799.5	0.23	581.03
Patients Tested with Melanoma	2,188		809.9	253	11.56%	160,016	96,519.4	13.67	3123.94
365-day follow-up									
All Patients Tested	12,481	16%	7,221.7	337	2.70%	50,654,778	81,071,781.9	0.25	466.65
Patients Tested with Melanoma	2,020		1,154.2	272	13.47%	161,322	138,465.8	12.52	2356.60
EGFR									
183-day follow-up									
All Patients Tested	16,388	64%	5,921.2	950	5.80%	63,190,269	94,414,887.8	0.26	1604.41
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer	10,557		3,767.1	785	7.44%	162,279	110,465.4	65.05	2083.83
365-day follow-up									
All Patients Tested	14,452	66%	7,737.7	993	6.87%	50,651,807	81,063,002.0	0.29	1283.33
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer	9,509		5,046.8	840	8.83%	150,374	124,099.4	63.24	1664.42
BCR-ABL									
183-day follow-up									
All Patients Tested	17,107	16%	6,714.6	939	5.49%	63,186,225	94,404,382.9	0.27	1398.45
Patients Tested with Leukemia	2,685		909.4	644	23.99%	97,271	91,262.6	27.60	7081.69
365-day follow-up									
All Patients Tested	14,701	15%	9,401.1	784	5.33%	50,648,701	81,054,430.4	0.29	833.95
Patients Tested with Leukemia	2,156		1,226.8	521	24.17%	91,045	102,434.4	23.68	4246.76

Table 1: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria

	Patients Receiving Test	Percentage of Patients Tested with Colorectal / All Patients Tested	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
BRCA									
183-day follow-up									
All Patients Tested	90,072	4%	37,419.4	26	0.03%	63,190,371	94,340,887.2	1.43	6.95
Patients Tested with Ovarian Cancer	3,850		1,557.1	20	0.52%	49,448	37,517.6	77.86	128.44
365-day follow-up									
All Patients Tested	77,129	5%	53,426.8	29	0.04%	50,648,976	80,990,808.3	1.52	5.43
Patients Tested with Ovarian Cancer	3,494		2,276.6	23	0.66%	47,028	44,337.4	74.30	101.03
720-day follow-up									
All Patients Tested	58,706	5%	56,831.2	35	0.06%	38,274,244	61,877,382.7	1.53	6.16
Patients Tested with Ovarian Cancer	2,809		2,469.6	29	1.03%	43,829	47,342.1	64.09	117.43

[1] Cancer treatments differ for each genetic test: KRAS scenarios include Cetuximab and Panitumumab; BRAF scenarios inlcude Trametinib, Dabrafenib, Vemurafenib, and Cobimetinib; EGRF scenarios include Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, and Gefitinib; BCR-ABL scenarios include Dasatinib, Imatinib, Bosutinib, Nilotinib, and Ponatinib; BRCA scenarios include Olaparib.

Table 2: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Age Group

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
KRAS								
183-day follow-up								
All Patients Tested								
0-21 Years	228	91.0	2	0.88%	16,837,970	23,987,496.6	0.01	219.90
22-44 Years	1,660	649.7	60	3.61%	23,352,746	29,365,356.4	0.07	923.49
45-64 Years	7,921	3,006.8	332	4.19%	19,195,183	28,406,560.3	0.41	1104.16
65+ Years	5,273	1,968.9	261	4.95%	7,363,854	12,659,691.8	0.72	1325.62
Patients Tested with Colorectal Cancer								
0-21 Years	7	3.0	2	28.57%	389	177.0	17.99	6726.52
22-44 Years	511	201.3	52	10.18%	9,901	6,753.3	51.61	2582.85
45-64 Years	3,027	1,137.7	289	9.55%	72,293	54,153.1	41.87	2540.22
65+ Years	2,240	830.6	233	10.40%	97,226	78,545.8	23.04	2805.28
365-day follow-up								
All Patients Tested								
0-21 Years	196	120.4	2	1.02%	13,538,793	20,362,603.3	0.01	166.13
22-44 Years	1,385	842.9	66	4.77%	17,979,544	24,087,134.9	0.08	783.02
45-64 Years	6,817	3,972.5	357	5.24%	15,870,616	24,967,862.5	0.43	898.67
65+ Years	4,747	2,685.2	291	6.13%	6,315,258	11,649,835.2	0.75	1083.71
Patients Tested with Colorectal Cancer								
0-21 Years	5	3.0	2	40.00%	392	256.5	12.76	6592.96
22-44 Years	442	279.4	57	12.90%	8,980	7,448.4	49.22	2040.30
45-64 Years	2,619	1,531.8	320	12.22%	67,396	62,811.9	38.86	2089.02
65+ Years	2,045	1,184.4	266	13.01%	94,847	98,674.8	21.56	2245.95
BRAF								
183-day follow-up								
All Patients Tested								
0-21 Years	297	120.6	5	1.68%	16,837,967	23,987,414.9	0.02	414.44
22-44 Years	2,002	787.1	43	2.15%	23,352,755	29,365,130.3	0.09	546.31
45-64 Years	7,312	2,781.3	164	2.24%	19,195,549	28,408,447.7	0.38	589.66
65+ Years	4,665	1,732.4	103	2.21%	7,364,257	12,661,806.6	0.63	594.56

Table 2: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Age Group

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
Patients Tested with Melanoma								
0-21 Years	10	3.4	2	20.00%	1,366	670.4	7.32	5830.01
22-44 Years	255	98.9	38	14.90%	22,615	12,055.8	11.28	3841.44
45-64 Years	959	357.2	127	13.24%	72,869	42,532.3	13.16	3555.71
65+ Years	964	350.4	86	8.92%	66,633	41,260.9	14.47	2454.68
365-day follow-up								
All Patients Tested								
0-21 Years	252	162.9	5	1.98%	13,538,785	20,362,529.0	0.02	306.99
22-44 Years	1,666	1,031.5	49	2.94%	17,979,553	24,086,949.6	0.09	475.06
45-64 Years	6,337	3,676.4	172	2.71%	15,871,253	24,970,008.8	0.40	467.85
65+ Years	4,226	2,350.9	111	2.63%	6,315,877	11,652,294.5	0.67	472.15
Patients Tested with Melanoma								
0-21 Years	9	4.6	2	22.22%	1,388	954.2	6.48	4387.39
22-44 Years	228	140.2	44	19.30%	22,181	16,518.8	10.28	3138.99
45-64 Years	871	500.2	134	15.38%	73,666	60,433.9	11.82	2678.72
65+ Years	912	509.2	92	10.09%	68,605	60,558.9	13.29	1806.63
EGFR								
183-day follow-up								
All Patients Tested								
0-21 Years	109	44.0	1	0.92%	16,837,967	23,987,580.2	0.01	227.09
22-44 Years	1,064	402.2	50	4.70%	23,352,738	29,365,802.3	0.05	1243.14
45-64 Years	7,442	2,707.7	401	5.39%	19,194,496	28,405,742.9	0.39	1480.94
65+ Years	7,773	2,767.2	498	6.41%	7,362,897	12,655,762.4	1.06	1799.64
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
0-21 Years	10	4.6	0	0.00%	451	214.8	22.17	0.00
22-44 Years	253	92.0	33	13.04%	4,604	2,155.7	54.95	3588.88
45-64 Years	4,113	1,475.6	315	7.66%	53,750	32,804.9	76.52	2134.71
65+ Years	6,181	2,195.0	437	7.07%	106,440	75,289.9	58.07	1990.91

Table 2: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Age Group

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
365-day follow-up								
All Patients Tested								
0-21 Years	89	53.8	1	1.12%	13,538,796	20,362,679.2	0.01	185.85
22-44 Years	882	502.6	47	5.33%	17,979,550	24,087,508.6	0.05	935.09
45-64 Years	6,426	3,463.9	413	6.43%	15,869,841	24,966,974.1	0.40	1192.30
65+ Years	7,055	3,717.4	532	7.54%	6,314,144	11,645,840.1	1.12	1431.12
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
0-21 Years	8	6.1	0	0.00%	459	308.1	17.43	0.00
22-44 Years	223	124.1	31	13.90%	4,284	2,710.2	52.05	2498.46
45-64 Years	3,607	1,922.7	338	9.37%	48,519	35,834.8	74.34	1757.91
65+ Years	5,671	2,993.9	471	8.31%	100,275	85,246.3	56.55	1573.20
BCR-ABL								
183-day follow-up								
All Patients Tested								
0-21 Years	307	127.1	12	3.91%	16,837,841	23,987,155.5	0.02	944.23
22-44 Years	3,816	1,503.7	217	5.69%	23,351,412	29,361,139.7	0.16	1443.14
45-64 Years	8,334	3,239.7	464	5.57%	19,192,063	28,400,040.8	0.43	1432.23
65+ Years	4,650	1,844.2	246	5.29%	7,362,119	12,656,046.9	0.63	1333.95
Patients Tested with Leukemia								
0-21 Years	100	39.0	9	9.00%	8,937	8,446.4	11.19	2309.76
22-44 Years	551	172.3	168	30.49%	10,629	6,226.2	51.84	9750.21
45-64 Years	1,148	374.8	311	27.09%	32,391	26,739.8	35.44	8297.32
65+ Years	886	323.3	156	17.61%	48,057	49,850.1	18.44	4825.25
365-day follow-up								
All Patients Tested								
0-21 Years	252	173.8	9	3.57%	13,538,659	20,362,271.7	0.02	517.91
22-44 Years	3,102	2,018.6	168	5.42%	17,978,196	24,083,328.6	0.17	832.26
45-64 Years	7,213	4,526.0	386	5.35%	15,868,019	24,962,151.5	0.45	852.86
65+ Years	4,134	2,682.8	221	5.35%	6,313,803	11,646,678.6	0.65	823.78

Table 2: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Age Group

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
Patients Tested with Leukemia								
0-21 Years	80	53.3	7	8.75%	8,361	9,644.2	9.57	1312.77
22-44 Years	401	214.8	122	30.42%	9,849	7,549.6	40.71	5679.10
45-64 Years	923	500.8	251	27.19%	30,229	29,631.6	30.53	5012.23
65+ Years	752	457.9	141	18.75%	45,528	55,608.9	16.52	3079.29
BRCA								
183-day follow-up								
All Patients Tested								
0-21 Years	972	404.4	0	0.00%	16,837,921	23,986,874.8	0.06	0.00
22-44 Years	34,040	14,090.9	2	0.01%	23,351,066	29,333,661.9	1.46	1.42
45-64 Years	48,492	20,264.9	18	0.04%	19,191,931	28,361,816.8	2.53	8.88
65+ Years	6,568	2,659.1	6	0.09%	7,363,435	12,658,533.8	0.89	22.56
Patients Tested with Ovarian Cancer								
0-21 Years	7	2.5	0	0.00%	592	400.2	11.82	0.00
22-44 Years	491	197.4	1	0.20%	7,517	4,399.9	65.32	50.66
45-64 Years	2,408	988.6	14	0.58%	25,084	18,475.1	96.00	141.62
65+ Years	944	368.6	5	0.53%	17,695	14,242.4	53.35	135.63
365-day follow-up								
All Patients Tested								
0-21 Years	843	580.4	0	0.00%	13,538,720	20,361,997.3	0.06	0.00
22-44 Years	28,127	19,469.5	1	0.00%	17,976,024	24,056,559.3	1.56	0.51
45-64 Years	42,362	29,540.2	20	0.05%	15,865,955	24,923,182.0	2.67	6.77
65+ Years	5,797	3,836.6	8	0.14%	6,315,039	11,649,069.7	0.92	20.85
Patients Tested with Ovarian Cancer								
0-21 Years	4	2.7	0	0.00%	567	499.4	7.05	0.00
22-44 Years	427	270.1	0	0.00%	7,036	5,326.9	60.69	0.00
45-64 Years	2,199	1,472.5	16	0.73%	23,908	21,537.7	91.98	108.66
65+ Years	864	531.2	7	0.81%	17,108	16,973.5	50.50	131.77

Table 2: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Age Group

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Percentage of Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
720-day follow-up								
All Patients Tested								
0-21 Years	649	612.3	0	0.00%	10,057,689	15,200,394.2	0.06	0.00
22-44 Years	19,971	19,357.8	2	0.01%	12,706,105	17,048,076.7	1.57	1.03
45-64 Years	33,456	32,678.8	25	0.07%	12,480,653	19,747,110.7	2.68	7.65
65+ Years	4,630	4,182.3	8	0.17%	5,384,672	9,881,801.1	0.86	19.13
Patients Tested with Ovarian Cancer								
0-21 Years	4	3.4	0	0.00%	557	562.3	7.18	0.00
22-44 Years	304	268.4	1	0.33%	6,165	5,535.3	49.31	37.26
45-64 Years	1,797	1,631.2	21	1.17%	21,974	22,488.5	81.78	128.74
65+ Years	704	566.6	7	0.99%	16,841	18,755.9	41.80	123.55

[1] Cancer treatments differ for each genetic test: KRAS scenarios include Cetuximab and Panitumumab; BRAF scenarios inlcude Trametinib, Dabrafenib, Vemurafenib, and Cobimetinib; EGRF scenarios include Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, and Gefitinib; BCR-ABL scenarios include Dasatinib, Imatinib, Bosutinib, Nilotinib, and Ponatinib; BRCA scenarios include Olaparib.

Table 3: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Sex

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
KRAS								
183-day follow-up								
All Patients Tested								
Female	8,251	3,164.8	281	3.41%	32,125,807	48,240,210.8	0.26	887.89
Male	6,827	2,549.9	374	5.48%	31,063,299	46,175,125.3	0.22	1466.73
Unknown	4	1.7	0	0.00%	2,775	3,769.1	1.44	0.00
Patients Tested with Colorectal Cancer								
Female	2,637	994.6	255	9.67%	85,718	67,887.2	30.76	2563.74
Male	3,146	1,176.9	321	10.20%	89,776	71,733.3	35.04	2727.43
Unknown	2	1.0	0	0.00%	13	8.7	153.85	0.00
365-day follow-up								
All Patients Tested								
Female	7,198	4,258.2	316	4.39%	25,794,490	41,512,796.3	0.28	742.09
Male	5,943	3,359.9	400	6.73%	24,857,011	39,551,316.8	0.24	1190.51
Unknown	4	2.9	0	0.00%	2,132	3,322.7	1.88	0.00
Patients Tested with Colorectal Cancer								
Female	2,345	1,385.3	285	12.15%	82,061	83,295.1	28.58	2057.25
Male	2,764	1,611.5	360	13.02%	84,830	85,883.0	32.58	2233.99
Unknown	2	1.8	0	0.00%	13	13.5	153.85	0.00
BRAF								
183-day follow-up								
All Patients Tested								
Female	7,917	3,034.0	117	1.48%	32,125,993	48,241,517.9	0.25	385.63
Male	6,357	2,386.9	198	3.11%	31,063,802	46,177,508.8	0.20	829.54
Unknown	2	0.5	0	0.00%	2,775	3,772.8	0.72	0.00
Patients Tested with Melanoma								
Female	817	303.2	92	11.26%	75,059	44,394.6	10.88	3034.05
Male	1,371	506.7	161	11.74%	84,952	52,121.7	16.14	3177.73
Unknown	0	0.0	0		5	3.2	0.00	---

Table 3: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Sex

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
365-day follow-up								
All Patients Tested								
Female	6,910	4,055.8	125	1.81%	25,794,804	41,514,299.2	0.27	308.20
Male	5,569	3,165.4	212	3.81%	24,857,842	39,554,155.8	0.22	669.75
Unknown	2	0.5	0	0.00%	2,132	3,326.9	0.94	0.00
Patients Tested with Melanoma								
Female	768	439.3	100	13.02%	75,791	64,196.2	10.13	2276.35
Male	1,252	714.9	172	13.74%	85,523	74,264.0	14.64	2405.91
Unknown	0	0.0	0		8	5.6	0.00	---
EGFR								
183-day follow-up								
All Patients Tested								
Female	9,040	3,307.5	552	6.11%	32,124,842	48,237,438.9	0.28	1668.92
Male	7,345	2,612.5	398	5.42%	31,062,652	46,173,678.8	0.24	1523.44
Unknown	3	1.2	0	0.00%	2,775	3,770.1	1.08	0.00
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
Female	5,519	1,987.9	475	8.61%	82,725	58,206.9	66.72	2389.45
Male	5,036	1,778.2	310	6.16%	79,546	52,253.9	63.31	1743.34
Unknown	2	1.0	0	0.00%	8	4.7	250.00	0.00
365-day follow-up								
All Patients Tested								
Female	7,967	4,375.4	571	7.17%	25,793,341	41,509,909.6	0.31	1305.02
Male	6,482	3,360.2	422	6.51%	24,856,334	39,549,768.7	0.26	1255.88
Unknown	3	2.1	0	0.00%	2,132	3,323.7	1.41	0.00
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
Female	4,974	2,701.2	499	10.03%	76,927	65,897.7	64.66	1847.34
Male	4,533	2,343.7	341	7.52%	73,438	58,196.9	61.73	1454.98
Unknown	2	1.9	0	0.00%	9	4.8	222.22	0.00

Table 3: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Sex

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
BCR-ABL								
183-day follow-up								
All Patients Tested								
Female	9,627	3,831.5	394	4.09%	32,123,204	48,232,651.5	0.30	1028.32
Male	7,478	2,882.5	545	7.29%	31,060,246	46,167,960.0	0.24	1890.74
Unknown	2	0.7	0	0.00%	2,775	3,771.5	0.72	0.00
Patients Tested with Leukemia								
Female	1,195	411.3	264	22.09%	44,036	40,447.8	27.14	6419.07
Male	1,490	498.1	380	25.50%	53,230	50,810.7	27.99	7628.78
Unknown	0	0.0	0		5	4.1	0.00	---
365-day follow-up								
All Patients Tested								
Female	8,287	5,381.4	329	3.97%	25,792,126	41,505,918.6	0.32	611.36
Male	6,412	4,018.5	455	7.10%	24,854,443	39,545,186.1	0.26	1132.26
Unknown	2	1.1	0	0.00%	2,132	3,325.6	0.94	0.00
Patients Tested with Leukemia								
Female	961	555.4	212	22.06%	41,534	46,147.1	23.14	3817.31
Male	1,195	671.5	309	25.86%	49,506	56,282.6	24.14	4601.96
Unknown	0	0.0	0		5	4.6	0.00	---
BRCA								
183-day follow-up								
All Patients Tested								
Female	85,649	35,711.7	23	0.03%	32,123,556	48,157,994.9	2.67	6.44
Male	4,419	1,705.8	3	0.07%	31,064,041	46,179,124.2	0.14	17.59
Unknown	4	1.9	0	0.00%	2,774	3,768.1	1.44	0.00
Patients Tested with Ovarian Cancer								
Female	3,847	1,555.9	20	0.52%	49,034	37,334.7	78.46	128.54
Male	2	0.7	0	0.00%	409	178.2	4.89	0.00
Unknown	1	0.5	0	0.00%	5	4.7	200.00	0.00

Table 3: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Sex

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
365-day follow-up								
All Patients Tested								
Female	73,321	51,147.9	26	0.04%	25,788,793	41,431,919.8	2.84	5.08
Male	3,804	2,275.5	3	0.08%	24,858,051	39,555,566.1	0.15	13.18
Unknown	4	3.4	0	0.00%	2,132	3,322.5	1.88	0.00
Patients Tested with Ovarian Cancer								
Female	3,491	2,274.3	23	0.66%	46,572	44,046.5	74.96	101.13
Male	2	1.2	0	0.00%	451	285.1	4.43	0.00
Unknown	1	1.0	0	0.00%	5	5.8	200.00	0.00
720-day follow-up								
All Patients Tested								
Female	55,785	54,572.0	32	0.06%	19,562,558	31,799,333.0	2.85	5.86
Male	2,918	2,256.1	3	0.10%	18,710,076	30,075,232.7	0.16	13.30
Unknown	3	3.1	0	0.00%	1,610	2,817.0	1.86	0.00
Patients Tested with Ovarian Cancer								
Female	2,807	2,466.9	29	1.03%	43,279	46,907.1	64.86	117.56
Male	1	1.3	0	0.00%	544	427.8	1.84	0.00
Unknown	1	1.4	0	0.00%	6	7.2	166.67	0.00

[1] Cancer treatments differ for each genetic test: KRAS scenarios include Cetuximab and Panitumumab; BRAF scenarios inlcude Trametinib, Dabrafenib, Vemurafenib, and Cobimetinib; EGRF scenarios include Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, and Gefitinib; BCR-ABL scenarios include Dasatinib, Imatinib, Bosutinib, Nilotinib, and Ponatinib; BRCA scenarios include Olaparib.

Table 4: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Year

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
KRAS								
183-day follow-up								
All Patients Tested								
2013	4,728	1,972.0	272	5.75%	44,428,580	35,275,868.1	0.11	1379.28
2014	6,313	2,580.7	269	4.26%	45,831,521	35,210,459.3	0.14	1042.36
2015	4,041	1,163.6	114	2.82%	40,564,031	23,932,777.8	0.10	979.68
Patients Tested with Colorectal Cancer								
2013	2,112	860.9	247	11.70%	101,650	52,930.9	20.78	2869.20
2014	2,357	943.0	234	9.93%	103,260	52,084.6	22.83	2481.35
2015	1,316	368.7	95	7.22%	85,120	34,613.6	15.46	2576.81
365-day follow-up								
All Patients Tested								
2013	4,185	2,963.1	313	7.48%	36,308,724	30,688,325.0	0.12	1056.32
2014	5,343	3,506.4	298	5.58%	35,617,463	29,697,790.4	0.15	849.88
2015	3,617	1,151.5	105	2.90%	33,072,113	20,681,320.4	0.11	911.82
Patients Tested with Colorectal Cancer								
2013	1,912	1,321.2	288	15.06%	101,786	64,669.3	18.78	2179.77
2014	2,023	1,316.5	267	13.20%	98,430	61,748.1	20.55	2028.15
2015	1,176	360.9	90	7.65%	86,562	42,774.2	13.59	2493.97
BRAF								
183-day follow-up								
All Patients Tested								
2013	3,809	1,622.2	118	3.10%	44,429,155	35,277,362.6	0.09	727.40
2014	6,025	2,515.4	130	2.16%	45,832,702	35,212,048.7	0.13	516.81
2015	4,442	1,283.7	67	1.51%	40,564,836	23,933,388.2	0.11	521.92
Patients Tested with Melanoma								
2013	760	308.9	92	12.11%	85,003	36,350.9	8.94	2978.33
2014	845	331.4	107	12.66%	86,058	35,917.5	9.82	3228.78
2015	583	169.6	54	9.26%	69,541	24,251.0	8.38	3184.29

Table 4: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Year

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
365-day follow-up								
All Patients Tested								
2013	3,391	2,477.8	131	3.86%	36,309,768	30,690,088.5	0.09	528.70
2014	5,109	3,452.1	139	2.72%	35,618,884	29,699,571.8	0.14	402.65
2015	3,981	1,291.8	67	1.68%	33,073,254	20,682,121.6	0.12	518.67
Patients Tested with Melanoma								
2013	699	478.6	104	14.88%	92,129	52,424.6	7.59	2173.06
2014	763	490.7	113	14.81%	89,894	50,469.6	8.49	2302.81
2015	558	184.9	55	9.86%	77,685	35,571.5	7.18	2974.39
EGFR								
183-day follow-up								
All Patients Tested								
2013	5,020	1,972.5	334	6.65%	44,427,209	35,274,234.3	0.11	1693.30
2014	6,923	2,713.0	385	5.56%	45,830,126	35,208,875.8	0.15	1419.09
2015	4,445	1,235.7	231	5.20%	40,562,910	23,931,777.6	0.11	1869.37
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
2013	3,670	1,420.7	289	7.87%	87,768	41,835.0	41.81	2034.16
2014	4,282	1,636.2	321	7.50%	88,803	41,196.0	48.22	1961.84
2015	2,605	710.2	175	6.72%	71,726	27,434.4	36.32	2464.26
365-day follow-up								
All Patients Tested								
2013	4,508	2,874.4	385	8.54%	36,307,240	30,686,613.7	0.12	1339.40
2014	5,918	3,626.1	385	6.51%	35,615,967	29,696,180.1	0.17	1061.75
2015	4,026	1,237.2	223	5.54%	33,070,771	20,680,208.2	0.12	1802.44
Patients Tested with Colorectal Cancer OR Non-Small Cell Lung Cancer								
2013	3,335	2,069.6	342	10.25%	84,177	47,114.0	39.62	1652.53
2014	3,754	2,242.5	326	8.68%	82,007	45,452.7	45.78	1453.75
2015	2,420	734.7	172	7.11%	69,958	31,532.7	34.59	2340.94

Table 4: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Year

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
BCR-ALB								
183-day follow-up								
All Patients Tested								
2013	5,373	2,308.8	384	7.15%	44,424,058	35,271,700.4	0.12	1663.21
2014	7,110	3,005.6	341	4.80%	45,825,676	35,204,813.0	0.16	1134.53
2015	4,624	1,400.2	214	4.63%	40,557,089	23,927,869.6	0.11	1528.39
Patients Tested with Leukemia								
2013	1,198	451.1	273	22.79%	58,567	33,586.2	20.46	6051.48
2014	883	300.1	236	26.73%	59,975	34,143.5	14.72	7865.09
2015	604	158.2	135	22.35%	50,993	23,532.9	11.84	8533.58
365-day follow-up								
All Patients Tested								
2013	4,699	3,677.8	337	7.17%	36,304,979	30,684,671.9	0.13	916.32
2014	6,016	4,339.9	273	4.54%	35,612,594	29,692,845.3	0.17	629.04
2015	3,986	1,383.4	174	4.37%	33,066,051	20,676,913.2	0.12	1257.78
Patients Tested with Leukemia								
2013	1,013	689.3	237	23.40%	56,784	38,134.7	17.84	3438.49
2014	695	405.5	183	26.33%	55,576	37,515.9	12.51	4513.00
2015	448	132.1	101	22.54%	50,061	26,783.8	8.95	7647.71
BRCA								
183-day follow-up								
All Patients Tested								
2013	32,042	14,747.9	0	0.00%	44,427,624	35,262,365.6	0.72	0.00
2014	34,721	15,779.5	7	0.02%	45,808,125	35,177,231.0	0.76	4.44
2015	23,309	6,892.0	19	0.08%	40,523,141	23,901,290.6	0.58	27.57
Patients Tested with Ovarian Cancer								
2013	1,268	576.9	0	0.00%	29,203	15,023.4	43.42	0.00
2014	1,488	661.1	4	0.27%	28,135	13,799.0	52.89	60.50
2015	1,094	319.1	16	1.46%	21,895	8,695.2	49.97	501.43

Table 4: Summary of Genetic Testing and Subsequent Cancer Treatment in the Sentinel Distributed Database between January 1, 2013 and December 31, 2015, by Follow-up Period and Inclusion Criteria and Year

	Patients Receiving Test	Years at Risk	Patients Receiving Cancer Treatment[1] within Follow-up	Patients Receiving Cancer Treatment / Patients Tested	Eligible Members	Member- Years	Patients Receiving Tests / 1K Eligible Members	Patients Receiving Cancer Treatments / 10K Years at Risk
365-day follow-up								
All Patients Tested								
2013	27,853	23,702.6	0	0.00%	36,306,350	30,671,002.6	0.77	0.00
2014	29,119	23,019.4	11	0.04%	35,595,788	29,667,268.4	0.82	4.78
2015	20,157	6,704.8	18	0.09%	33,035,398	20,652,537.3	0.61	26.85
Patients Tested with Ovarian Cancer								
2013	1,173	973.4	0	0.00%	29,080	17,822.5	40.34	0.00
2014	1,289	971.6	8	0.62%	26,511	15,987.4	48.62	82.34
2015	1,032	331.6	15	1.45%	22,023	10,527.5	46.86	452.41
720-day follow-up								
All Patients Tested								
2013	20,945	30,010.2	8	0.04%	29,687,740	23,079,937.7	0.71	2.67
2014	22,829	21,843.6	14	0.06%	29,033,950	23,245,395.5	0.79	6.41
2015	14,932	4,977.4	13	0.09%	24,738,209	15,552,049.4	0.60	26.12
Patients Tested with Ovarian Cancer								
2013	928	1,247.1	8	0.86%	29,889	18,766.9	31.05	64.15
2014	1,070	954.8	11	1.03%	27,420	17,468.0	39.02	115.21
2015	811	267.7	10	1.23%	21,372	11,107.2	37.95	373.60

[1] Cancer treatments differ for each genetic test: KRAS scenarios include Cetuximab and Panitumumab; BRAF scenarios inlcude Trametinib, Dabrafenib, Vemurafenib, and Cobimetinib; EGRF scenarios include Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, and Gefitinib; BCR-ABL scenarios include Dasatinib, Imatinib, Bosutinib, Nilotinib, and Ponatinib; BRCA scenarios include Olaparib.

Appendix A: Latest Date of Available Data for Each Data Partner up to Request End Date (5/15/2016)

DP ID	End Date
DP0001	6/30/2015
DP0002	4/30/2015
DP0003	12/31/2014
DP0004	10/31/2014
DP0005	11/30/2015
DP0006	2/28/2015
DP0007	12/31/2015
DP0008	9/30/2015
DP0009	11/30/2015
DP0010	7/31/2015
DP0011	7/31/2014
DP0012	9/30/2015
DP0013	6/30/2015
DP0014	10/31/2015

Appendix B: List of Procedure Codes used to Define Exposures in this Request

Code	Description	Code Type
KRAS		
81275	KRAS (v-Ki-ras2 Kirsten rat sarcoma viral oncogene) (eg, carcinoma) gene analysis, variants in codons 12 and 13	CPT-4 Procedure
S3713	Kras mutation analysis testing	HCPCS Procedure
BRAF		
81210	BRAF (v-raf murine sarcoma viral oncogene homolog B1) (eg, colon cancer), gene analysis, V600E variant	CPT-4 Procedure
EGFR		
81235	EGFR (epidermal growth factor receptor) (eg, non-small cell lung cancer) gene analysis, common variants (eg, exon 19 LREA deletion, L858R, T790M, G719A, G719S, L861Q)	CPT-4 Procedure
BCR-ABL		
81207	BCR/ABL1 (t(9;22)) (eg, chronic myelogenous leukemia) translocation analysis; minor breakpoint, qualitative or quantitative	CPT-4 Procedure
81206	BCR/ABL1 (t(9;22)) (eg, chronic myelogenous leukemia) translocation analysis; major breakpoint, qualitative or quantitative	CPT-4 Procedure
81208	BCR/ABL1 (t(9;22)) (eg, chronic myelogenous leukemia) translocation analysis; other breakpoint, qualitative or quantitative	CPT-4 Procedure
BRCA		
81211	BRCA1, BRCA2 (breast cancer 1 and 2) (eg, hereditary breast and ovarian cancer) gene analysis; full sequence analysis and common duplication/deletion variants in BRCA1 (ie, exon 13 del 3.835kb, exon 13 dup 6kb, exon 14-20 del 26kb, exon 22 del 510bp, exon 8-9 del 7.1kb)	CPT-4 Procedure
81212	BRCA1, BRCA2 (breast cancer 1 and 2) (eg, hereditary breast and ovarian cancer) gene analysis; 185delAG, 5385insC, 6174delT variants	CPT-4 Procedure
81213	BRCA1, BRCA2 (breast cancer 1 and 2) (eg, hereditary breast and ovarian cancer) gene analysis; uncommon duplication/deletion variants	CPT-4 Procedure
81214	BRCA1 (breast cancer 1) (eg, hereditary breast and ovarian cancer) gene analysis; full sequence analysis and common duplication/deletion variants (ie, exon 13 del 3.835kb, exon 13 dup 6kb, exon 14-20 del 26kb, exon 22 del 510bp, exon 8-9 del 7.1kb)	CPT-4 Procedure
81215	BRCA1 (breast cancer 1) (eg, hereditary breast and ovarian cancer) gene analysis; known familial variant	CPT-4 Procedure
81216	BRCA2 (breast cancer 2) (eg, hereditary breast and ovarian cancer) gene analysis; full sequence analysis	CPT-4 Procedure
81217	BRCA2 (breast cancer 2) (eg, hereditary breast and ovarian cancer) gene analysis; known familial variant	CPT-4 Procedure
S3818	Complete gene sequence analysis; BRCA1 gene	HCPCS Procedure
S3819	Complete gene sequence analysis; BRCA2 gene	HCPCS Procedure
S3820	Complete BRCA1 and BRCA2 gene sequence analysis for susceptibility to breast and ovarian cancer	HCPCS Procedure
S3822	Single mutation analysis (in individual with a known BRCA1 or BRCA2 mutation in the family) for susceptibility to breast and ovarian cancer	HCPCS Procedure
S3823	Three-mutation BRCA1 and BRCA2 analysis for susceptibility to breast and ovarian cancer in Ashkenazi individuals	HCPCS Procedure

Appendix C: List of ICD-9 Diagnosis Codes used to Define Inclusion Criteria in this Request

Code	Description
Colorectal Cancer	
153	Malignant neoplasm of colon
153.1	Malignant neoplasm of transverse colon
153.2	Malignant neoplasm of descending colon
153.3	Malignant neoplasm of sigmoid colon
153.6	Malignant neoplasm of ascending colon
153.9	Malignant neoplasm of colon, unspecified site
154	Malignant neoplasm of rectum, rectosigmoid
154.1	Malignant neoplasm of rectum
154.8	Malignant neoplasm of other sites of rectum,
230.3	Carcinoma in situ of colon
230.4	Carcinoma in situ of rectum
Melanoma	
172	Malignant melanoma of skin
172.5	Malignant melanoma of skin of trunk, except scrotum
172.3	Malignant melanoma of skin of other and unspecified parts of face
172.8	Malignant melanoma of other specified sites of skin
172.2	Malignant melanoma of skin of ear and external auditory canal
172.6	Malignant melanoma of skin of upper limb, including shoulder
172.4	Malignant melanoma of skin of scalp and neck
172.1	Malignant melanoma of skin of eyelid, including canthus
172.9	Melanoma of skin, site unspecified
172.0	Malignant melanoma of skin of lip
172.7	Malignant melanoma of skin of lower limb, including hip
Lung Cancer	
162	Malignant neoplasm of trachea, bronchus, and lung
162.3	Malignant neoplasm of upper lobe, bronchus, or lung
162.4	Malignant neoplasm of middle lobe, bronchus, or lung
162.5	Malignant neoplasm of lower lobe, bronchus, or lung
162.8	Malignant neoplasm of other parts of bronchus or lung
162.9	Malignant neoplasm of bronchus and lung, unspecified site
231.2	Carcinoma in situ of bronchus and lung
Leukemia	
204	Lymphoid leukemia
204.0	Acute lymphoid leukemia
204.00	Acute lymphoid leukemia, without mention of having achieved remission
204.01	Acute lymphoid leukemia in remission
204.02	Acute lymphoid leukemia, in relapse
204.1	Chronic lymphoid leukemia
204.10	Chronic lymphoid leukemia, without mention of having achieved remission
204.11	Chronic lymphoid leukemia in remission
204.12	Chronic lymphoid leukemia, in relapse
204.2	Subacute lymphoid leukemia
204.20	Subacute lymphoid leukemia, without mention of having achieved remission
204.21	Subacute lymphoid leukemia in remission
204.22	Subacute lymphoid leukemia, in relapse
204.8	Other lymphoid leukemia
204.80	Other lymphoid leukemia, without mention of having achieved remission
204.81	Other lymphoid leukemia in remission
204.82	Other lymphoid leukemia, in relapse

204.9	Unspecified lymphoid leukemia
204.90	Unspecified lymphoid leukemia, without mention of having achieved remission
204.91	Unspecified lymphoid leukemia in remission
204.92	Unspecified lymphoid leukemia, in relapse
205	Myeloid leukemia
205.0	Acute myeloid leukemia
205.00	Acute myeloid leukemia, without mention of having achieved remission
205.01	Acute myeloid leukemia in remission
205.02	Acute myeloid leukemia, in relapse
205.1	Chronic myeloid leukemia
205.10	Chronic myeloid leukemia, without mention of having achieved remission
205.11	Chronic myeloid leukemia in remission
205.12	Chronic myeloid leukemia, in relapse
205.2	Subacute myeloid leukemia
205.20	Subacute myeloid leukemia, without mention of having achieved remission
205.21	Subacute myeloid leukemia in remission
205.22	Subacute myeloid leukemia, in relapse
205.8	Other myeloid leukemia
205.80	Other myeloid leukemia, without mention of having achieved remission
205.81	Other myeloid leukemia in remission
205.82	Other myeloid leukemia, in relapse
205.9	Unspecified myeloid leukemia
205.90	Unspecified myeloid leukemia, without mention of having achieved remission
205.91	Unspecified myeloid leukemia in remission
205.92	Unspecified myeloid leukemia, in relapse
206	Monocytic leukemia
206.0	Acute monocytic leukemia
206.00	Acute monocytic leukemia, without mention of having achieved remission
206.01	Acute monocytic leukemia in remission
206.02	Acute monocytic leukemia, in relapse
206.1	Chronic monocytic leukemia
206.10	Chronic monocytic leukemia, without mention of having achieved remission
206.11	Chronic monocytic leukemia in remission
206.12	Chronic monocytic leukemia, in relapse
206.2	Subacute monocytic leukemia
206.20	Subacute monocytic leukemia, without mention of having achieved remission
206.21	Subacute monocytic leukemia in remission
206.22	Subacute monocytic leukemia, in relapse
206.8	Other monocytic leukemia
206.80	Other monocytic leukemia, without mention of having achieved remission
206.81	Other monocytic leukemia in remission
206.82	Other monocytic leukemia, in relapse
206.9	Unspecified monocytic leukemia
206.90	Unspecified monocytic leukemia, without mention of having achieved remission
206.91	Unspecified monocytic leukemia in remission
206.92	Unspecified monocytic leukemia, in relapse
207	Other specified leukemia
207.0	Acute erythremia and erythroleukemia
207.00	Acute erythremia and erythroleukemia, without mention of having achieved remission
207.01	Acute erythremia and erythroleukemia in remission
207.02	Acute erythremia and erythroleukemia, in relapse
207.2	Megakaryocytic leukemia
207.20	Megakaryocytic leukemia, without mention of having achieved remission
207.21	Megakaryocytic leukemia in remission

207.22	Megakaryocytic leukemia, in relapse
207.8	Other specified leukemia
207.80	Other specified leukemia, without mention of having achieved remission
207.81	Other specified leukemia in remission
207.82	Other specified leukemia, in relapse
208	Leukemia of unspecified cell type
208.0	Acute leukemia of unspecified cell type
208.00	Acute leukemia of unspecified cell type, without mention of having achieved remission
208.01	Acute leukemia of unspecified cell type in remission
208.02	Acute leukemia of unspecified cell type, in relapse
208.1	Chronic leukemia of unspecified cell type
208.10	Chronic leukemia of unspecified cell type, without mention of having achieved remission
208.11	Chronic leukemia of unspecified cell type in remission
208.12	Chronic leukemia of unspecified cell type, in relapse
208.2	Subacute leukemia of unspecified cell type
208.20	Subacute leukemia of unspecified cell type, without mention of having achieved remission
208.21	Subactue leukemia of unspecified cell type in remission
208.22	Subacute leukemia of unspecified cell type, in relapse
208.8	Other leukemia of unspecified cell type
208.80	Other leukemia of unspecified cell type, without mention of having achieved remission
208.81	Other leukemia of unspecified cell type in remission
208.82	Other leukemia of unspecified cell type, in relapse
208.9	Unspecified leukemia
208.90	Unspecified leukemia, without mention of having achieved remission
208.91	Unspecified leukemia in remission
208.92	Unspecified leukemia, in relapse
Ovarian Cancer	
183	Malignant neoplasm of ovary and other uterine adnexa
183.0	Malignant neoplasm of ovary

Appendix D: Generic and Brand Names used to Define Events in this Request

Generic Name	Brand Name
CETUXIMAB	Erbitux
PANITUMUMAB	Vectibix
COBIMETINIB FUMARATE	Cotellic
TRAMETINIB DIMETHYL SULFOXIDE	Mekinist
DABRAFENIB MESYLATE	Tafinlar
VEMURAFENIB	Zelboraf
AFATINIB DIMALEATE	Gilotrif
GEFITINIB	Iressa
OSIMERTINIB MESYLATE	Tagrisso
ERLOTINIB HCL	Tarceva
BOSUTINIB	Bosulif
IMATINIB MESYLATE	Gleevec
PONATINIB HCL	Iclusig
DASATINIB	Sprycel
NILOTINIB HCL	Tasigna
OLAPARIB	Lynparza

Appendix E: List of Procedure Codes used to Define Events in this Request

Code	Description	Code Type
KRAS Drug Pairs		
J9055	Injection, cetuximab, 10 mg	HCPCS Procedure
C9235	Injection, panitumumab, 10 mg	HCPCS Procedure
C9215	Injection, cetuximab, per 10 mg	HCPCS Procedure
J9303	Injection, panitumumab, 10 mg	HCPCS Procedure
EGFR Drug Pairs		
J9055	Injection, cetuximab, 10 mg	HCPCS Procedure
C9235	Injection, panitumumab, 10 mg	HCPCS Procedure
C9215	Injection, cetuximab, per 10 mg	HCPCS Procedure
J9303	Injection, panitumumab, 10 mg	HCPCS Procedure
J8565	Gefitinib, oral, 250 mg	HCPCS Procedure
BCR-ABL Drug Pairs		
S0088	Imatinib, 100 mg	HCPCS Procedure

Appendix F: Modular Program Specifications for cder_mpl1r_wp031_nsdp_v01

The Cohort Identification and Descriptive Analysis (CIDA) tool, version 2.2.1, will assess the rates of drug initiation within 183 or 365 days after testing among individuals who received tests of interest (among those with relevant cancers). The query period was from January 1, 2013 - Current, and the enrollment gap was set at 45 days. Age groups were split as follows: 0-21, 22-44, 45-64, 65+.In total, 22 scenarios were examined in this request.

Enrollment Gap: 45 Days
Age Groups: 0-21, 22-44, 45-64, 65+
Query Period: January 1, 2013 - Current
Coverage Requirement: Medical and Drug

	Drug/Exposure									Inclusion/Exclusion				Event/Outcome					
Scenario	Incident exposure	Incident w/ respect to:	Washout (days)	Cohort Definition	Episode Gap	Exposure Extension Period	Follow up Duration (Days)	Min Episode Duration	Min Days Supplied	Criteria	Include/ Exclude	Lookback Start	Lookback End	Care Setting	Event/ Outcome	Care Setting/P DX	Incident with Respect to	Incident w/ respect to Care Setting/PDX	Washout (days)	Blackout Period
1	KRAS	KRAS	183	01	0	0	183	0	0	Colorectal Cancer	Include	-183	0	Any	Cetuximab, Panitumumab	Any	Cetuximab, Panitumumab	Any	183	0
2	KRAS	KRAS	365	01	0	0	365	0	0	Colorectal Cancer	Include	-365	0	Any	Cetuximab, Panitumumab	Any	Cetuximab, Panitumumab	Any	365	0
3	KRAS	KRAS	183	01	0	0	183	0	0	N/A	N/A	N/A	N/A	N/A	Cetuximab, Panitumumab	Any	Cetuximab, Panitumumab	Any	183	0
4	KRAS	KRAS	365	01	0	0	365	0	0	N/A	N/A	N/A	N/A	N/A	Cetuximab, Panitumumab	Any	Cetuximab, Panitumumab	Any	365	0
5	BRAF	BRAF	183	01	0	0	183	0	0	Metastatic Melanoma	Include	-183	0	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	183	0
6	BRAF	BRAF	365	01	0	0	365	0	0	Metastatic Melanoma	Include	-365	0	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	365	0
7	BRAF	BRAF	183	01	0	0	183	0	0	N/A	N/A	N/A	N/A	N/A	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	183	0
8	BRAF	BRAF	365	01	0	0	365	0	0	N/A	N/A	N/A	N/A	N/A	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	Trametinib, Dabrafenib, Vemurafenib, Cobimetinib	Any	365	0
9	EGFR	EGFR	183	01	0	0	183	0	0	Colorectal Cancer OR Non-Small Cell Lung Cancer	Include	-183	0	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib, Targresso	Any	183	0
10	EGFR	EGFR	365	01	0	0	365	0	0	Colorectal Cancer OR Non-Small Cell Lung Cancer	Include	-365	0	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib, Targresso	Any	365	0
11	EGFR	EGFR	183	01	0	0	183	0	0	N/A	N/A	N/A	N/A	N/A	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib, Targresso	Any	183	0
12	EGFR	EGFR	365	01	0	0	365	0	0	N/A	N/A	N/A	N/A	N/A	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib	Any	Cetuximab, Panitumumab, Afatinib, Erlotinib, Tagrisso, Gefitinib, Targresso	Any	365	0
13	BCR-ABL	BCR-ABL	183	01	0	0	183	0	0	Leukemia	Include	-183	0	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	183	0
14	BCR-ABL	BCR-ABL	365	01	0	0	365	0	0	Leukemia	Include	-365	0	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	365	0
15	BCR-ABL	BCR-ABL	183	01	0	0	183	0	0	N/A	N/A	N/A	N/A	N/A	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	183	0
16	BCR-ABL	BCR-ABL	365	01	0	0	365	0	0	N/A	N/A	N/A	N/A	N/A	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	Dasatinib, Imatinib, Bosutinib, Nilotinib, Ponatinib	Any	365	0
17	BRCA	BRCA	183	01	0	0	183	0	0	Ovarian Cancer	Include	-183	0	Any	Olaparib	Any	Olaparib	Any	183	0
18	BRCA	BRCA	365	01	0	0	365	0	0	Ovarian Cancer	Include	-365	0	Any	Olaparib	Any	Olaparib	Any	365	0
19	BRCA	BRCA	720	01	0	0	720	0	0	Ovarian Cancer	Include	-720	0	Any	Olaparib	Any	Olaparib	Any	720	0
20	BRCA	BRCA	183	01	0	0	183	0	0	N/A	N/A	N/A	N/A	N/A	Olaparib	Any	Olaparib	Any	183	0
21	BRCA	BRCA	365	01	0	0	365	0	0	N/A	N/A	N/A	N/A	N/A	Olaparib	Any	Olaparib	Any	365	0
22	BRCA	BRCA	720	01	0	0	720	0	0	N/A	N/A	N/A	N/A	N/A	Olaparib	Any	Olaparib	Any	720	0

ICD-9, ICD-10, HCPCS, and CPT codes are provided by Optum360. NDC codes are checked against First Data Bank's "National Drug Data File (NDDF®) Plus"

Cohort Definition of 01 will only consider the first incident episode for each user during the query period that satisfies the washout period.

Note: Episode is automatically truncated at outcome.